Managing water

- Herps have to manage water over both short and long time scales
- Use a variety of behavioral and physiological mechanisms

Short-term Water Balance

- Many herps have daily cycles related to water balance
- Especially common in terrestrial amphibians

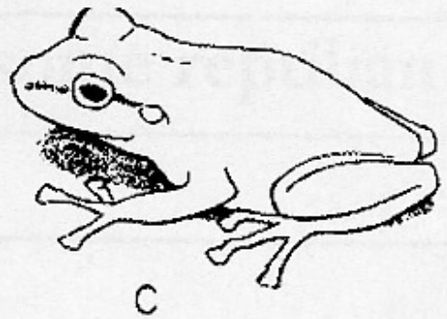
Example: Posture of coquí

A

Water conserving

B

Chin up



C

Low alert

D

High alert

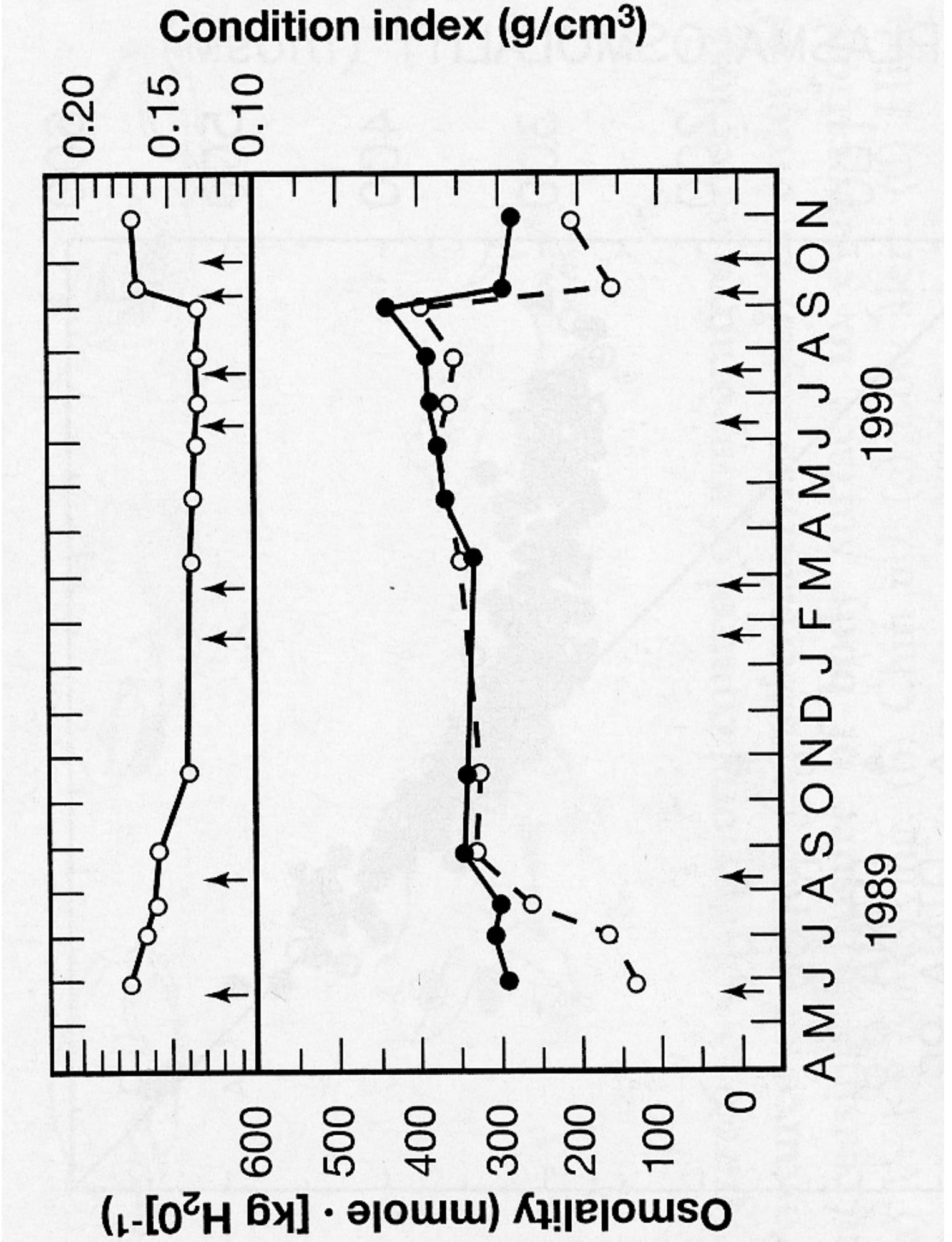
E

Calling

Pough et al. 1983

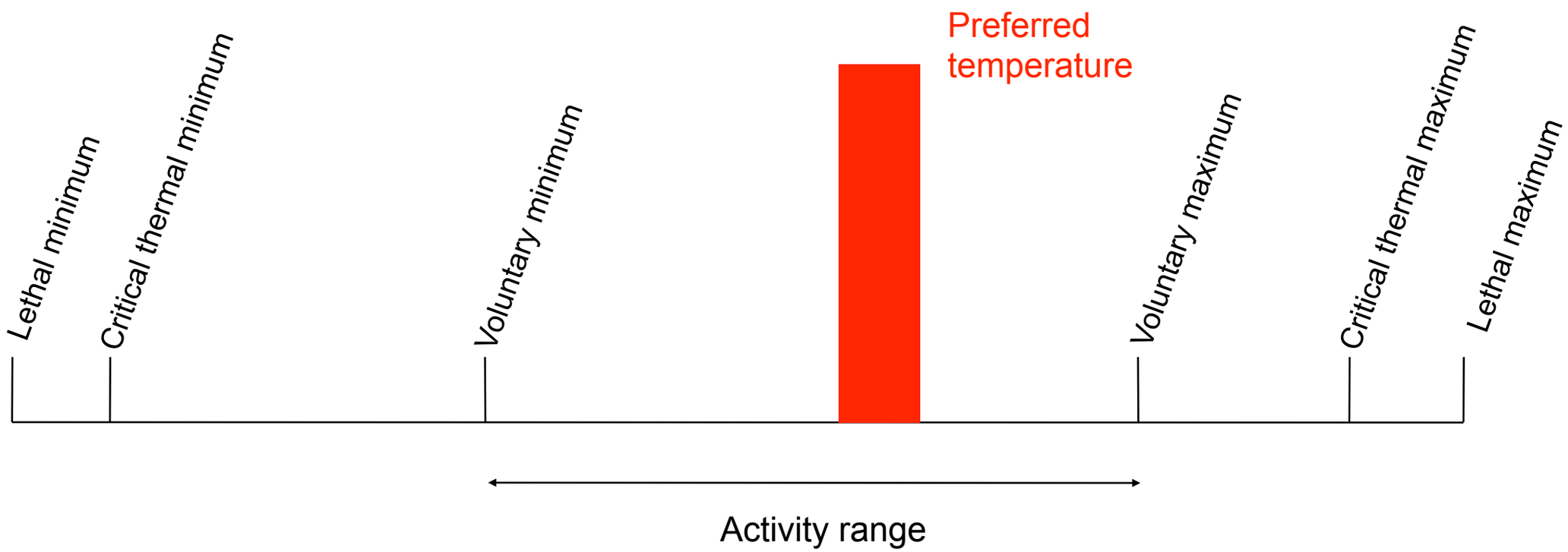
Long-term Water Balance

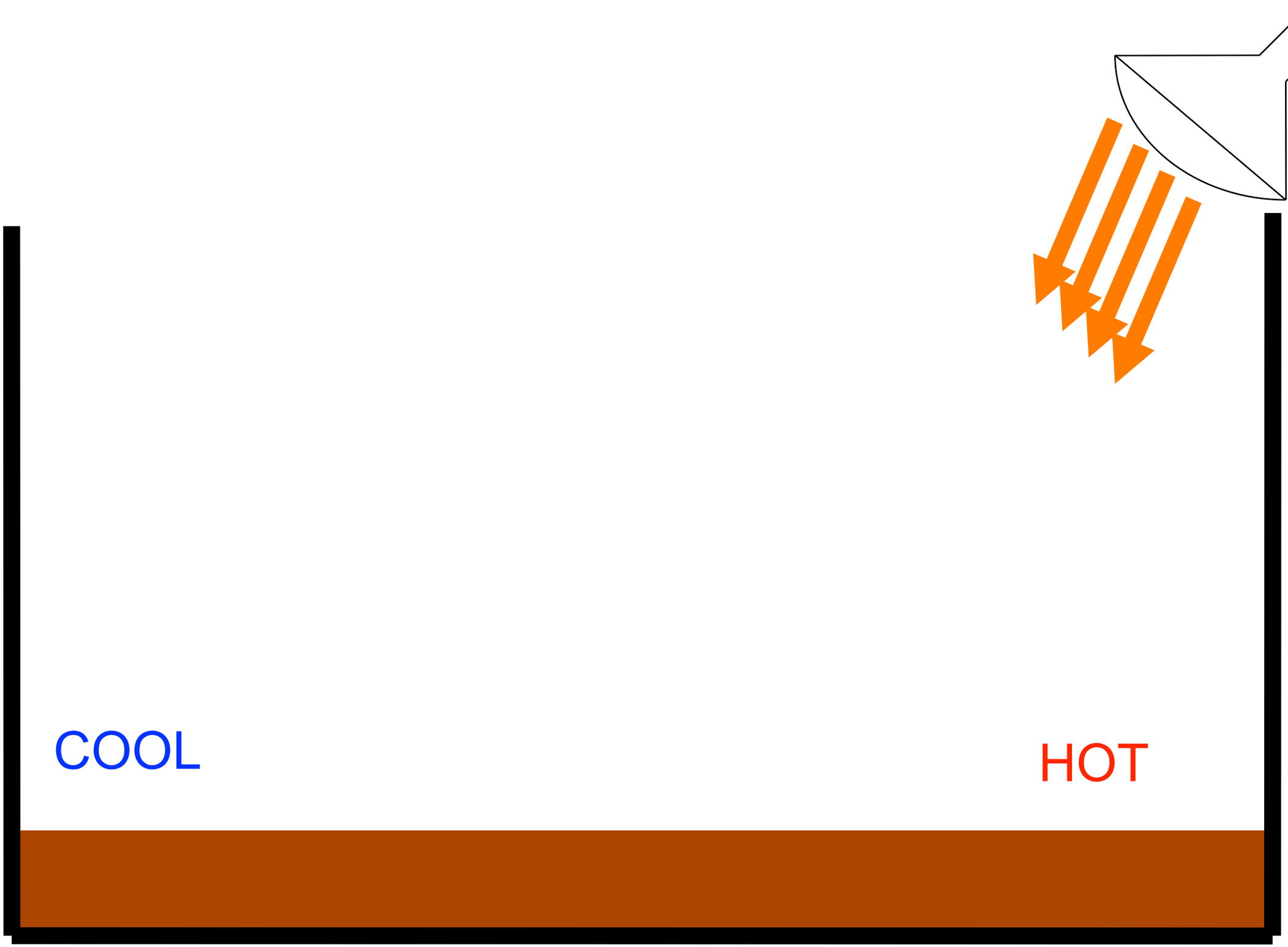
- Water flux is much slower in reptiles
- Water, salt can fluctuate over long time periods
- Example: desert tortoise

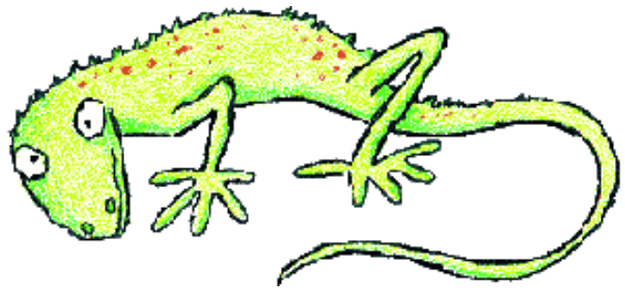

Condition index (g/cm3)
0.20
0.15
0.10
Osmolality (mmole · [kg H2O]-1)
600
500
400
300
200
100
0
J F M A M J J A S O N
1990
A M J J A S O N D J
1989

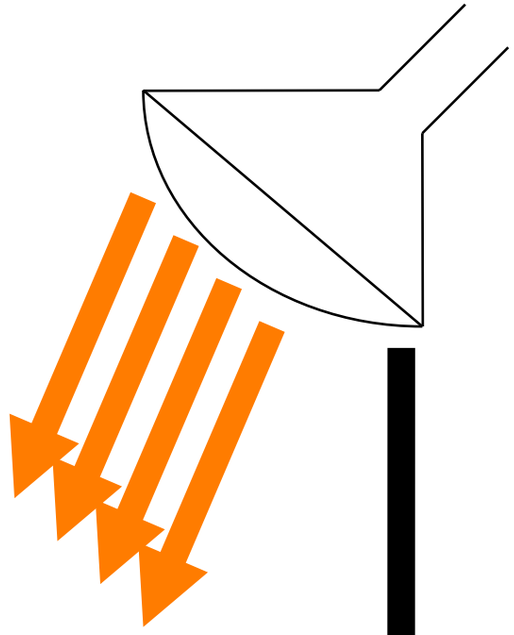
Behavioral Thermoregulation

- Ectotherms are not “cold blooded”
- Most species maintain their body temperatures within a narrow range




COOL
HOT

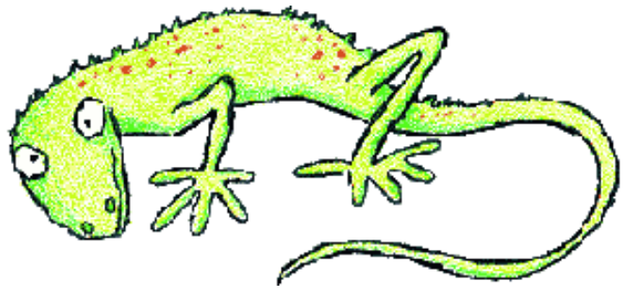




COOL

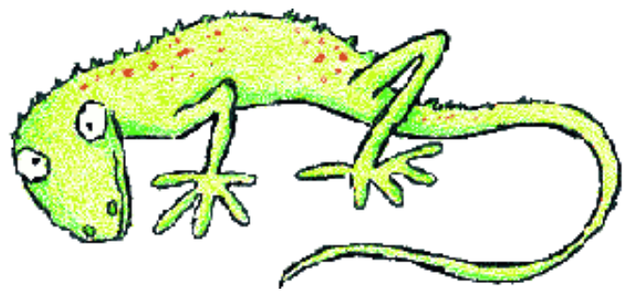
HOT

COOL

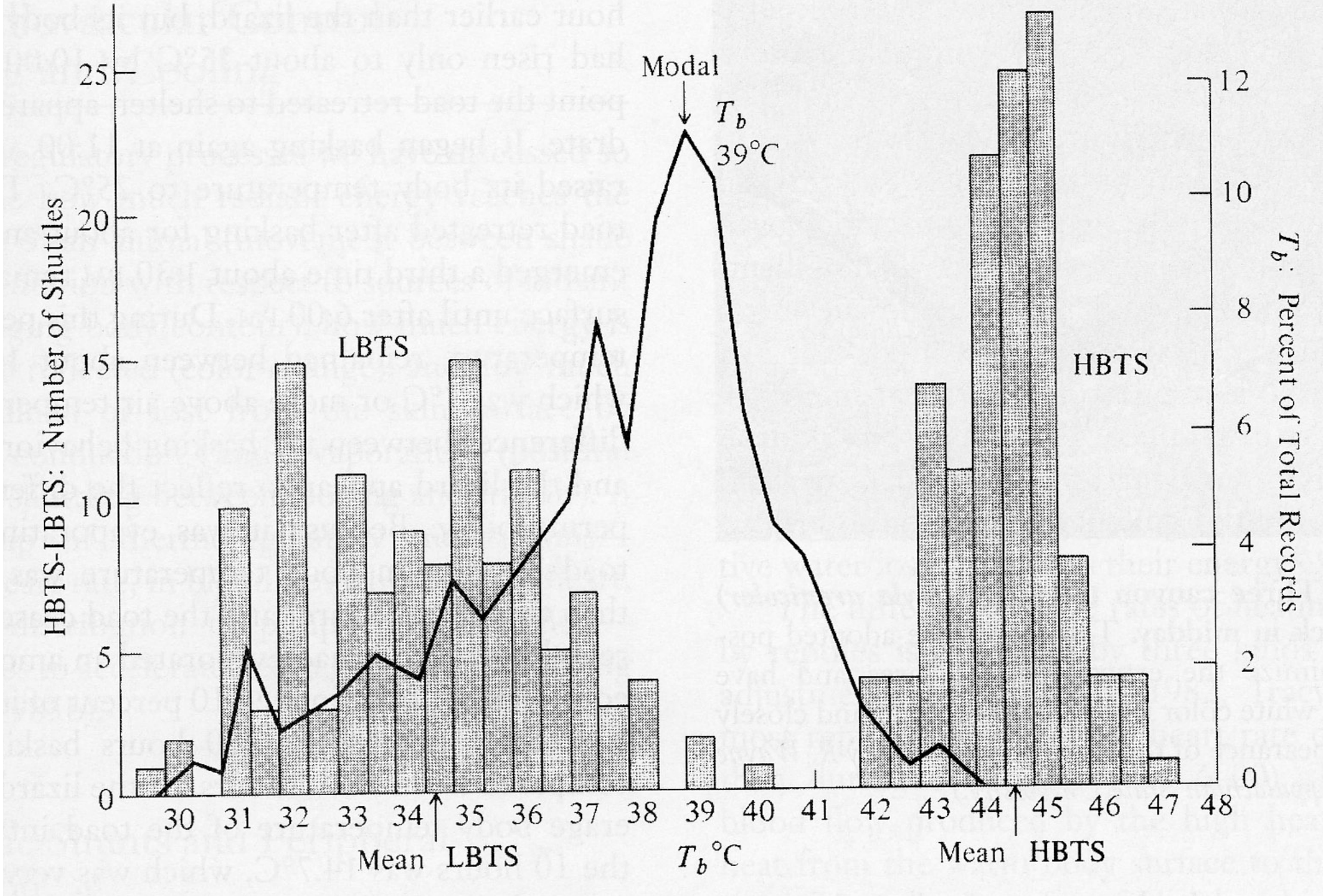


HOT

COOL



HOT



Desert iguana, *Dipsosaurus dorsalis*

Reproduction

- Gametogenesis
- Reproductive ecology
- Life history strategies

Life history

- An organisms life history includes traits that directly affect survival and reproductive potential
  - Examples: age-specific survivorship, brood size, size of young, distribution of reproductive effort, etc.
- A set of rules that determine how an organism allocates energy through its life

Brood Size

- Main trade-off: many small or few large eggs/offspring
- Varies widely across both reptiles and amphibians

Brood Size

- Amphibians:
  - many bufonids produce thousands of eggs per clutch
  - some *Eleuthrodactylus* frogs produce a few large eggs or offspring

Brood Size

- Reptiles tend to produce fewer large eggs/ offspring
- some groups (geckos, anoles) tend to have smaller clutches (1-2 eggs) but lay eggs more frequently

Seasonality

- Seasonal reproductive cycles are mediated by hormone levels (androgens + estrogens)
- Hormone levels can be **associated** (males and females peak at the same time) **disassociated** (males first), or **continual** (always high)

Seasonality

- Temperate species are basically all seasonal, but some breed in spring, others in the fall

Cophosaurus texanus,
a spring breeder

Sceloporus jarrovi,
a fall breeder

Seasonality

- Tropical species have different strategies
  - breed all year, only in the wet season, only in the dry season, etc.
- Example: lizards in the Caatinga, NE Brazil
  - 7 species reproduce continuously
  - 5 reproduce in the dry season
  - 1 reproduces in the wet season

Costs of Reproduction

- Species allocate energy to reproduction
- But there are costs to reproduction
- Example: gravid lizards run slower than nongravid lizards, and are more vulnerable to predators

Costs of Reproduction

- Can allocate lots of energy to one reproductive event - lots of offspring but high chance of death
- Or can spread smaller effort over the whole life span

Costs of Reproduction

- This model predicts that species that invest heavily in early reproduction will have short life spans
- This is true, in general, in amphibians
- By contrast, reptiles invest less effort per reproductive event but spread them out over their lives

Amphibian life-history strategies

- (Most) amphibians metamorphose, so their life-history patterns are complex
- Different life stages typically face different threats and have different levels of mortality
- Lots of variation in clutch size, reproductive timing, and life span

Reptile life-history strategies

- Crocodylians and turtles are long-lived, late maturing, and reproduce over many years
- Squamates vary from short-lived with high reproductive investment (e.g. *Uta*) to long-lived with small broods (e.g. *Cyclura*)
- Species have single vs. multiple broods, early versus late maturity

Nest or egg attendance & guarding

- Occurs in both reptiles and amphibians
- Functions vary: aeration, hydration, protection
- Example: nest attendance in glass frogs

Male (below) and female glass frog *Hyalinobatrachium valerioi* (Centrolenidae) with an egg clutch, La Gamba, Costa Rica

Egg or larvae transport

- Eggs/tadpoles/ froglets are often transported in frogs
- Transport often includes brooding
- Crocodylians transport young to water
- Example: *Crocodylus*

Egg brooding

- Retaining the eggs and/ or larvae in the body of the parent for a longer period than usual
- Found in amphibians (common) and reptiles (pythons)
- Example: Marsupial frogs (e.g. *Gastrotheca*)

Feeding of Young

- Rare, but seen in some frogs and caecilians
- Some frogs feed "trophic eggs" (infertile) to their tadpoles
- Skin feeding in caecilians

Guarding or attending young

- Uncommon, but occurs in some frogs, viviparous lizards, and crocodylians
- Lots of cool examples in frogs
- Baby crocodiles vocalize, even in eggs, and can emit distress calls

Corucia zebrata live in family groups

General Categories of Parental Care

1. Nest or egg attendance/guarding
2. Egg, larval, or hatchling transport
3. Egg brooding
4. Feeding of young
5. Guarding or attending young

Parental Care

- E1 25:26
- E2 17:30
- E2 32:30
- E3 4:00
- E3 25:05